Model Number MT2834ZPX
Owner's Manual

Owner's Manual

82041404 Revision E — 11/25/96

#MT2834ZPX

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Record of Revisions

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E (11/25/96)	Manual revised. This manual documents enhancements implemented in firmware version 0.22. Theses enhancements include extended V.34 rates (33.6K/31.2K); and overall format and editorial changes throughout this manual.

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Contents

Chapter 1 - Introduction and Description

Introduction 5
Modem Features 5
Fax Features 6
Product Description 6
How to Use This Manual 7

Chapter 2 - Installation and Configuration

Installation 9
Safety Warnings 9
Configuration/Installation Procedure 10
Is Your MT2834ZPX Ready for Use? 12
Operating Your MT2834ZPX 13
Simple Operations 14

Chapter 3 - Software Configuration

Introduction 15
    ConfiguringSoftware for Your Modem 15
PC Initialization Strings 16
Changing Default Parameters 17
Configuring Software for Your Computer 17
    Configuring Software for the Remote System 18
    Terminal Emulation 18
    File Transfer Protocols 19
When to Disable Data Compression 19
    Disabling Error Correction 20
The 16550 UART and Windows 3.1 20

Chapter 4 - AT Commands, S-Registers and Result Codes

Dialing/On-Line/Answering 22
Modem AT Commands 23
    Remote Configuration 38
    Remote Configuration Procedures 38
    Password Commands 39
S-Registers 40
    AT Commands and S-Register Summary 48

Chapter 5 - Troubleshooting

Troubleshooting 49
The Modem Does Not Respond to Commands 49
The Modem Dials But Cannot Make a Connection 51
The Modem Disconnects While Online 53
The Modem Cannot Connect When Answering 54
File Transfer Is Slower Than It Should Be 54
Losing Data 54
Getting Garbage Characters on the Monitor 55
Fax and Communications Software Won't Run at the Same Time 55

Chapter 6 - Testing Your Modem

Local Analog Loopback Test/V.54 Loop 3 56
Digital Loopback Test/V.54 Loop 2 (Local/Manual) 57
Digital Loopback Test/V.54 Loop 2 (Remote/Automatic) 58

Chapter 7 - Service, Warranty and Tech Support

Introduction 60
Limited Warranty 60
On-line Warranty Registration 61
Tech Support 61
Recording Modem Information 61
Service 62
About the Multi-Tech BBS 63
To log on to the Multi-Tech BBS 63
To Download a file 63
About CompuServe/Internet 65
About the Multi-Tech Fax-Back Service 65

Appendix A - Technical Specifications

Appendix B - Tone Dial Frequencies

Appendix C - FCC and Canadian Regulations

FCC Regulations for Telephone Line Interconnection 71
Canadian Limitations Notice 74

Index

Chapter 1 - Introduction and Description

Introduction

Welcome to the world of data communications. You have acquired one of the finest intelligent data and fax modems available today, model MT2834ZPX, from Multi-Tech Systems. This Owner's Manual will help you install, configure, test and use your MT2834ZPX data/fax modem.

Modem Features

Your MT2834ZPX modem meets the proposed *Enhanced* V.34 ITU standard for data signalling rates as high as 33.6/31.2K bps full-duplex mode. Connections are made on Public Switched Telephone Networks (*PSTNs*). V.34 supports and is compatible with all V.32/V.32*bis*/ V32*terbo* features including EIA extended Automode, adaptive line probing, automatic symbol rate and carrier frequency during start-up, and retrain and rate renegotiation (in 2400 bps increments).

Your modem features CCITT V.42 error correction and V.42bis data compression, providing 100% error-free data transmission. V.42 error correction incorporates MNP(Classes 3 and 4, and LAP-M. You may select V.42bis data compression for 4-1 throughput, or MNP Class 5 for 2-1 throughput.)

Your MT2834ZPX offers interactive automatic dialing, as well as Command Mode option configuration. You may store up to ten command line/telephone numbers, of up to 60 characters each, in the modem's nonvolatile memory. The modem pulse or tone dials, and recognizes dial tones and busy signals for reliable call-progress detection. The modem can detect AT&T calling card tones. It is FCC-Registered for connection to telephone networks without any Data Access Arrangements (DAA's).

Your modem also features Remote Configuration which permits you to assist users at remote sites, saving you the time and trouble of site visits and preventing misinterpretation of configuration instructions.

Fax Features

Your MT2834ZPX meets the CCITT V.17 standard for sending and receiving faxes. When linked to a compatible fax machine or modem, it can transmit faxes at 14.4 K bps. It also meets the CCITT's Group 3 Designation for sending and receiving faxes at 9600 bps; and Group 2 Designation for sending and receiving faxes at 4800 bps. The MT2834ZPX is also downward-compatible with modems to speeds as low as 300 bps, so it can send and receive faxes with any fax machine in the world.

Product Description

The MT2834ZPX is a internal half-length fax/modem card for IBM Personal Computers (PC, XT, AT Pentium or compatible units); and fits into a full- or half-size expansion slot. The MT2834ZPX provides dial-up asynchronous communication capability with other personal computers, terminals, on-line computer services or other types of computer systems. Connection to the phone line is made possible by an RJ11 modular type connector. The MT2834ZPX can be configured as either a COM1, COM2, COM3, or COM4 communication port; with a selection of 5 IRQ values. Selection of a specific COM port/IRQ value is accomplished by choosing the proper berg jumpers located on the MT2834ZPX's circuit board. Hardware configuration and installation procedures are described in Chapter 2.

How to Use This Manual

This manual is divided into seven chapters and two appendices. The information contained in each chapter and appendix is as follows:

Chapter 1 - Introduction and Description

Chapter 1 begins with a short product introduction and description; followed by a guide (which you are now reading) to the use of this manual.

Chapter 2 - Installation and Connection

Chapter 2 documents the procedure for connecting the MT2834ZPX to your computer and to the phone line. Details are given, supported by illustrations on determining Base I/O addressing and setting IRQ values as a guide for installing your MT2834ZPX to the point of operation.

Chapter 3 - Software Configuration

Chapter 3 documents communication software configuration recommended specifically for the MT2834ZPX. There is also some discussion of how to identify the limitations and capabilities of your computer before the software installation process is done. Some other issues covered in this chapter include setting up initialization strings, changing default parameters, configuring software for the remote system and file transfer protocols.

Chapter 4 - "AT" Commands and S-Registers

This chapter focuses on the use of “AT” commands and S-Registers. Chapter 4 provides basic steps for originating and answering calls and a summary of commands that enable the user to establish, read, and modify parameters in addition to dialing.

Chapter 5 - Troubleshooting Your MT2834ZPX

Chapter 5 lists some basic and specific actions to take if your MT2834ZPX is not operational.

Chapter 6 - Testing Your Modem

Chapter 6 covers the modem's built-in test features. These are: Power-on Self Test, Local Analog Loopback, Digital Loopback and Remote Digital Loopback Tests. We have included a description of each test and how to use each test procedure.

Chapter 7 - Service, Warranty & Technical Support/ BBS

Chapter 7 provides instructions for getting modems serviced at the factory and information on product warranty; information about Multi-Tech's user Bulletin Board Service (*BBS*) and receiving technical support via the CompuServe and Internet forums.

Appendices

Appendix A - Technical Specifications
Appendix B - Tone Dial Frequencies
Appendix C - FCC and Canadian Regulations

Chapter 2 - Installation and Configuration

Installation

This chapter provides you with the procedures to install the Multi-Tech MT2834ZPX card in your ISA or EISA bus personal computer.

Hardware installation involves:

1) Opening your PC.
2) Setting card configuration (determining COM port setting and IRQ level).
3) Installing the card into the PC.

Safety Warnings

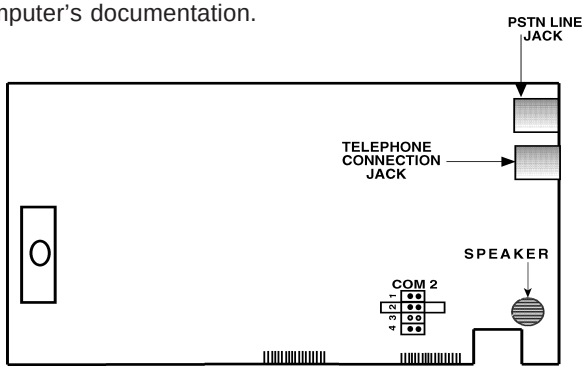
1. Never install telephone wiring during a lightning storm.
2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
3. This product is to be used with *UL* and *CUL* listed computers.
4. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
5. Use caution when installing or modifying telephone lines.
6. Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electrical shock from lightning.
7. Do not use the telephone to report a gas leak in the vicinity of the leak.

Configuration/Installation Procedure

Perform the procedures in Table 2-1 to configure and install the MT2834ZPX card into your ISA or EISA bus host computer.

Table 2-1. Configuration and Installation Procedure

Step	Procedure
1	Make sure your computer and any peripheral equipment connected to it, are turned off. Failure to do so may damage both your modem and your PC. The card may be installed in any 286-, 386- , 486- or Pentium based computer with an ISA or EISA bus architecture.
2	Remove the cover of your computer as instructed in your computer's documentation.



3	Locate the unused slot(s) which you will be using for your modem card, and remove the slot cover(s) per the instructions in your computer's documentation.
4	Figure 2-1 illustrates the default COM port and IRQ value setting for this card (COM2/IRQ3). If your application requires an alternate setting, remove the berg jumpers from the COM2/IRQ3 position and place them in a position that supports your application. The MT2834ZPX can be configured for either a COM1, COM2, COM3 or COM4 communication port; with a selection of five IRQ values for each port. By this means, the user may select an identical COM port because of the expanded IRQ value selection option (e.g., the MT2834ZPX has a factory default of COM2/IRQ3...a Mouse device can also be configured at COM2 but at IRQ4...a Printer device configured at COM2 but at IRQ7...).

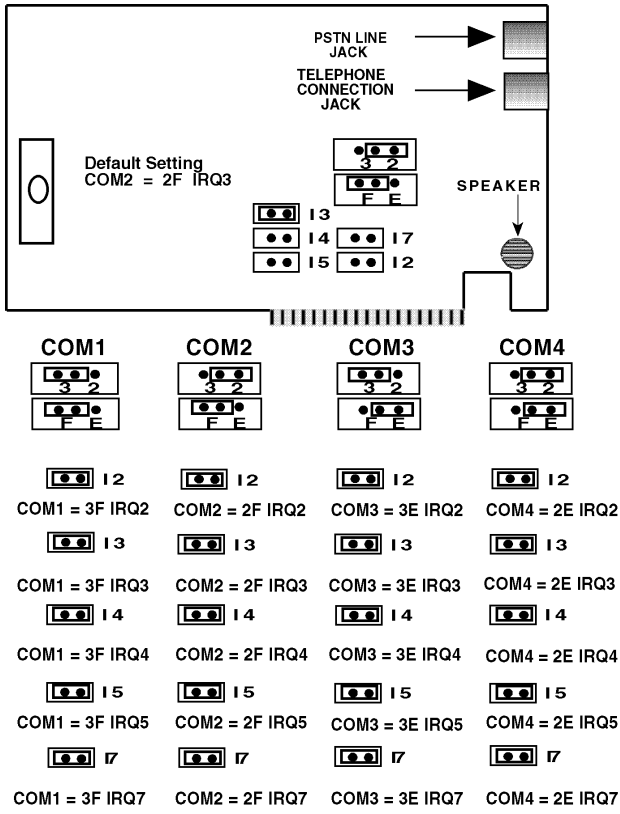


Figure 2-1. MT2834ZPX Printed Circuit Board and Alternate COM Port/IRQ Settings

Table 2-1 (Cont'd). Configuration and Installation Procedure

Step	Procedure
5	Install the MT2834ZPX card into the selected expansion slot(s) in the same manner as any other add-on card, as instructed in your computer's documentation.
6	Fasten the retaining bracket to the computer chassis and replace the cover.
7	Your MT2834ZPX requires a modular *LINE JACK*. This is typically an RJ11C or RJ11W jack, but could also be an RJ12 or RJ13 jack. To connect the modem to the PSTN line, plug one end of the RJ11 cable that is provided with the modem into the **LINE JACK** connector and the other end into the phone-company-provided RJ11C or RJ11W modular phone jack. If you wish to have a telephone set connected to the same telephone line for voice communications, you may plug a telephone set into the modem's connector labeled ***PHONE JACK***. This connector is provided as a convenience. Simply plug one end of the RJ11C's modular jack that is provided with the modem into the modem's *PHONE JACK* connector and the other end into the telephone's RJ11C's connector. **Note**: Any cables connected to the computer must be shielded to reduce interference.
8	Turn power on to your computer.

Is Your MT2834ZPX Ready for Use?

As soon as you connected power to the modem, if you're an experienced modem user, you may simply want to check your modem's settings for data compression, error correction, and so on. You may find that you can get moving quite quickly if you just issue an ***ATL5, ATL6*** and an ***ATL7*** command. These commands lists how your modem is currently configured. If you come across a setting you're unsure of, refer to Chapters 3 and 4 of this manual for **AT** command and S-Register explanations and defaults.

If you're a novice, please continue to the next sections of this chapter.

Operating Your MT2834ZPX

You control your MT2834ZPX by issuing **AT** commands and setting S-Registers. Right now your MT2834ZPX is set up for the most typical user application, that is, as a traditional modem set to make a dial-up call to a remote installation where the call is answered automatically; therefore, you shouldn't need to change the current default configuration. (If however, you know that your application does not follow this profile, please refer to Chapters 3 and 4 for AT Commands and S-Registers.)

In operating your MT2834ZPX it is likely that you will use your data communications software to either:

- enter "terminal" mode, where you can "speak most directly" to the modem by issuing AT commands, or to
- launch a datacomm session through a set of modem configurations which you select and then associate with a target telephone number. Once you have created, saved, and named this set of information according to your connection needs and your datacomm software's conventions, the software then simplifies your dialing because you needn't reconfigure your modem, nor run the risk of mistakenly keying-in incorrect information.

Either way, you need to understand that an **AT** command is the method by which your modem is controlled, and must therefore prefix nearly all commands. **AT** stands for attention, and alerts the modem that a command follows. You may enter these commands with either upper- or lower-case characters. Entering **AT** automatically sets the modem's serial baud rate to match your computer's and also sets the modem's parity. It also clears the modem's command buffer.

Once you're in terminal mode, enter **AT** followed by **<CR>** to check whether your modem is operational. If everything's fine, your modem will respond *OK*.

Simple Operations

You can dial a number by using the **ATD** command and the phone number of the modem with which you wish to connect, e.g., **ATD6127853500**. Your modem will dial the number; a “scrambling” noise is heard as the modem negotiates the kind of connection it can make, and once the modems have settled on a common connection, a connect message on your computer’s video is displayed.

To hang up a call, enter **+++ATH<CR>**. Your modem will return on hook, just as if you had returned a phone’s handset to its cradle. Your video now displays OK, signifying that your modem is ready for your next command.

Chapter 3 - Software Configuration

Introduction

Communications software must be configured to work with your modem, your computer, and the remote system it is calling. Fortunately, most communications programs make the process easy by providing a default *initialization string* for your modem as well as defaults for most of the other required parameters.

Configuring Software for Your Modem

Because remote computers may have different connection requirements such as speed, number of bits, parity, log-on sequences, etc., communications software is typically configured by *sessions*, each session having a unique configuration for a given connection (e.g., to a BBS or commercial on-line service). Most communications programs, however, have a separate modem configuration menu because modem configurations rarely change from session to session.

The most important configuration is the modem *initialization string.* This is a sequence of commands the software uses to configure the modem when the communications software is loaded or when a session begins. Always begin the initialization string with the ***AT***tention command **AT**, then follow it with the modem reset command, **&F**. Issuing a reset command before other commands ensures that you are starting with a known state.

The rest of the commands in the initialization string depend on the capabilities of the modem and what you want it to do. Some older communications programs require you to create the initialization string by yourself. Most modern communications programs, however, provide you with a ready-made initialization string that is automatically selected when you choose your modem model from a list. It is a poor idea to use an initialization string intended for another modem, especially one from another manufacturer, because modem capabilities and command implementations vary from modem to modem. However, if your MT2834ZPX does not appear on a modem list, you may use the MultiModemII initialization string.

PC Initialization Strings

We recommend the following initialization string for a MT2834ZPX connected to a PC-compatible computer:

AT &F X4 S0= 2 ^M

This string resets the MT2834ZPX to the factory default settings, selects extended result codes with *NO DIAL TONE* and *BUSY,* and turns on auto-answer to answer on the second ring. **^M** must end every string sent to the modem from software. It is the ASCII code for the RETURN key on most keyboards, and the default code for the carriage return character in the MT2834ZPX and most communications programs. The carriage return character is defined in the MT2834ZPX in S-register **S3**; if you change it, you must also change the carriage return character code used in your communications software. If you send a command directly to the modem in terminal mode rather than indirectly through communications software, you must end the command string by pressing the RETURN key (<CR>) instead of adding **^M** to the string.

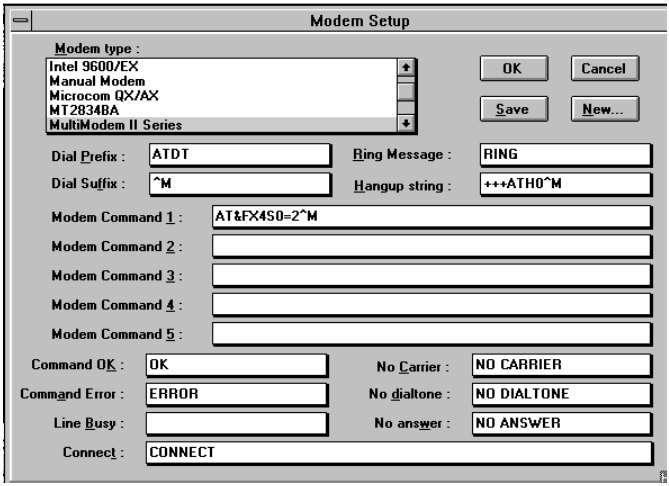


Figure 3-1. The MEW Modem Initialization Setup

*Note that the above and following setup screens are examples found in MultiExpress for Windows (*MEW*), and that other 3rd party data communication software is similar but different.

Changing Default Parameters

The default values for the other parameters in modem configuration menus rarely need changing. They typically include the dialing prefix (**ATDT** for touch-tone service and **ATDP** for rotary service), the dialing suffix (**^M**), the hang-up string (**+++ATH0^M**), and response messages (*RING, NO CARRIER, BUSY,* etc.). Communications software with a host mode might also include an auto-answer string (**AT S0=1^M**).

Configuring Software for Your Computer

You must configure your communications software to match your computer's configuration. If the MT2834ZPX is connected to the COM2 communications port, you must tell the software you are using COM2. Another important parameter is the serial port baud rate. This is the speed at which your modem communicates with your computer, *not* the speed at which your modem communicates with another modem. When V.42bis data compression is enabled, you must have a serial port baud rate four times the transmission speed of the modem to optimize making data compression effective.

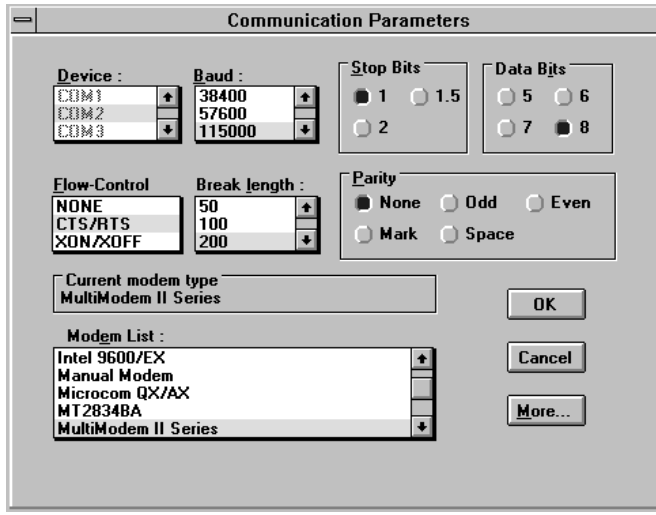


Figure 3-2. MEW Configuration Parameters Screen

Configuring Software for the Remote System

You must meet the requirements of the remote system for successful communications. Though the MT2834ZPX can automatically match the speed of the other modem, you must specify parameters such as type of flow control, break length, number of data bits, number of stop bits, and parity. If you set these parameters incorrectly with the remote system, gibberish will appear on your screen (See Figure 3-2).

Terminal Emulation

If you are accessing the remote computer as if from an on-site terminal, the keyboard codes used by your computer may not match the ones used by the remote computer. To be compatible with the remote computer, your software must be able to substitute the appropriate codes in what is known as *terminal emulation*. Most communications programs can emulate the most common mainframe terminals, including the DEC VT100, VT102, and VT52 terminals, and the basic TTY mode. If in doubt about which to choose for a BBS, try ANSI or VT100 first. The following is the MultiExpress for Windows Terminal Emulation selection screen:

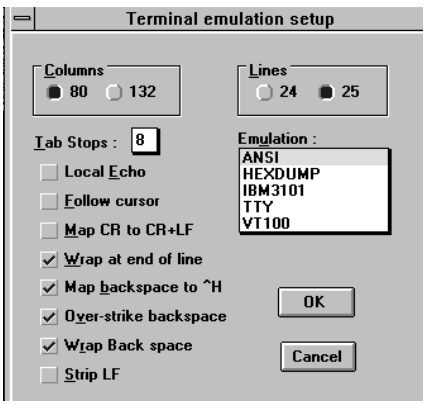


Figure 3-3. MEW Terminal Emulation Setup Screen

File Transfer Protocols

When you upload or download files with your modem, the host computer will ask which file transfer protocol you want to use. Most communications programs allow you to choose a default protocol. Your software's documentation should list the ones it can use (not all communications programs support all protocols). Zmodem is the default protocol in *MultiExpress for Windows*, and we recommend it for most transfers. The following is the *MEW* File Transfer Protocols screen:

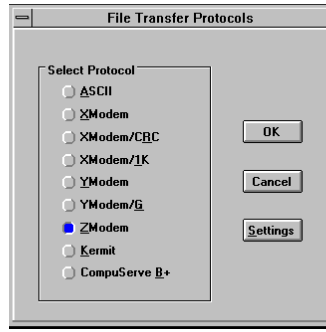


Figure 3-4. MEW File Transfer Protocols Screen

When to Disable Data Compression

The speed advantage hardware compression gives you is entirely dependent on how much the data being transmitted can be compressed. If the data is already in compressed form—a .ZIP or a .SIT file, for example—trying to compress it more will actually slow the transmission slightly compared to transmitting the same file with compression disabled. This effect will be most noticeable if your modem negotiates MNP 5 compression with the other modem. V.42bis will not try to further compress a compressed file, but MNP 5 will.

The command to disable compression is **AT &E14 <CR>**. If you use your modem mostly for downloading long, compressed files from BBSs, you may want to include the **&E14** command in your initialization string as follows:

AT &F S0=0 X4 &E14 ^M

As a general rule, you should try to transmit files in already-compressed form rather than relying on V.42bis hardware compression. Because software compression is more efficient than hardware compression, you will have a higher throughput with the former. Of course, this efficiency does not include the time spent compressing and decompressing .ZIP or .SIT files, but it will save on phone bills. And hardware compression will still be there for those occasions when it is inconvenient to compress a file with software.

Disabling Error Correction

By default, the MT2834ZPX is set to auto-reliable mode. In this mode the MT2834ZPX determines during the handshake whether the other modem is using V.42 error correction. If it is, the MT2834ZPX then switches itself to reliable mode and enables error correction. If it is not, the MT2834ZPX remains in non-error correction mode.

Typically, we recommend that you leave the MT2834ZPX set to auto-reliable mode (**&E1**). However, you may encounter some circumstances in which the MT2834ZPX will work better with error correction turned off. For example, it has been reported that on CompuServe error correction will slow file transfers at modem speeds of 9600 bps and under. If this is a problem for you, you can turn off error correction with the command **AT &E0**, or you can include the command in your initialization string as follows:

AT &F S0=0 X4 &E0 ^M

The 16550 UART and Windows 3.1

Windows 3.1 may cause a loss of data when communicating at high speed, even with a 16550 UART installed. Because Windows is multitasking—it switches between several programs running at the same time—it can make the serial port wait briefly while Windows performs other tasks. Meanwhile, incoming data can be lost. The older 8250A and 16450 UARTs can store data in a one-byte first in-first out (FIFO) buffer (a memory area in the UART in which the first bit in is the first out), but once the buffer is full, the data is lost. The 16550 has a 16-byte FIFO buffer, which accounts for much of its high speed. However, in Windows 3.1, the 16550's FIFO buffer is disabled by default.

To enable the buffer, use Notepad to open the SYSTEM.INI file in your Windows directory, and add the following line to the [386Enh] section:

COMnFIFO=1

where n is the number of the COM port the 16550 is installed on. For example, if the 16550 is installed on COM2, the line should be:

COM2FIFO=1

After you save SYSTEM.INI you must restart Windows for the change to take effect.

However, there is another problem when the FIFO buffer is enabled: Windows cannot recognize the COM port because of a bug in the Windows 3.1 serial port driver, COMM.DRV. The only way around this problem is to replace the COMM.DRV file in the WINDOWS\SYSTEM directory with another driver. Several drivers are available commercially or on BBSs that will solve this problem. A freeware driver called CyberCom is available as CYBERC.ZIP on CompuServe in the IBM Communications Forum, Library 0. CyberCom will enable Windows communications at speeds up to 115,200 bps if you have a 16550 UART installed.

Chapter 4 - AT Commands, S-Registers and Result Codes

Dialing/On-Line/Answering

There are several basic steps for *"originating"* and *"answering"* in data communication mode:

1. Load communication software
2. Dial
3. Establish On-Line connection
4. Terminate Call

A simple way to dial is from the keyboard of your computer or terminal. You enter a command on the keyboard to tell the MT2834ZPX to dial.

If you use a sophisticated communications software package (e.g., MultiExpress for Windows), the software tells you to enter phone numbers and other information. If this is the case, the software, and not you, gives the dialing commands to the modem. All of the commands, S-Registers and intelligent features of the MT2834ZPX is taken care of by the software.

If you are giving commands directly to your modem (and not through your software), each command must begin with **AT** (**AT**tention Characters). AT characters may be entered in upper or lower case.

Entering **AT** automatically sets the modem's speed to match the speed of the computer or terminal, and also sets the modem's parity. If you are using a terminal, you can issue commands directly, but computers must be placed in terminal mode before the modem recognizes commands. To operate the computer in terminal mode, you must run a data comm package like MultiExpress, or MultiExpress for Windows, depending on the type of datacomm call you want to place and whether you are calling under a DOS or Windows environment. Refer to your software's documentation to load and run the datacomm software.

AT characters alert the modem that a command follows. The AT Command can also be used to clear the command buffer, by simply typing **AT** and hitting RETURN.

The letter **D** in a command causes the modem to dial the numbers immediately following it (e.g., **ATD6127853500**).

The MT2834ZPX responds with *"CONNECT"* on your video display after the number is dialed and a connection signal is detected (since the MT2834ZPX defaults to Enhanced V.34/V.42/V.42*bis*, the actual response is "*CONNECT LAPM COMPRESSED*"). The modem is now in *"On-Line"* mode, and is ready to communicate with a host site.

If no connection signal is detected within 45 seconds (this time period can be adjusted by S-Register S7), the MT2834ZPX goes On Hook/ hangs up and returns to Command mode. At this point, your video displays "*NO CARRIER*".

Enter **+++ATH<CR>** to Hang Up On-Line (bring modem on-hook), and terminate the modem's On-Line mode. At this point, your video displays "*OK*".

In addition to the call originating capabilities, the MT2834ZPX can also automatically answer incoming calls. You need not be present. You can, however, control the situation by configuring the modem to either answer or not to answer, or to answer after a specified number of rings. This is done by setting the value of S-Register S0 (modem defaults to automatically answer an incoming call after one ring).

Modem AT Commands

AT commands are the means by which you, and your communications software, are able to communicate with and configure your modem. They enable you to establish, read, and modify parameters in addition to dialing. The following provides a summary and brief explanation of the AT commands recognized by the MT2834ZPX.

COMMAND: ***AT***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Attention Code that precedes most command strings except A/, A: and Escape Codes.

COMMAND: ***Return***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Pressing RETURN key executes most commands.

COMMAND: ***A***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Answer call, even if no ring present.

COMMAND: ***A/***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Repeat last command. (Do not precede this command with AT. Do not hit RETURN to execute.)

COMMAND: ***A:***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Continuous redial (10 redials in DOC units) of last number until answered.
(Not used in International Models.)

COMMAND: ***$***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

This symbol placed in dialing string enables the modem to detect AT&T's "call card" tones to access user's calling card when originating an on-line connection--

ATDT1028806127853500$123456789
(access/phone number) (Credit Card number)

COMMAND: ***$A***n
VALUES: ***n = 0 or 1***
DEFAULT: ***$A0***
DESCRIPTION:

$A0 discards data during auto-reliable time period.
$A1 buffers data during auto-reliable time period.

COMMAND: ***#A***n
VALUES: ***n = 0 thru 3***
DEFAULT: ***#A0***
DESCRIPTION:

#A0 selects initial handshake at 33,600 to 31,200 to 28,800 to 24000 to 21,600 to 19,200 to 16,800 to 14,400 to12,000 to9600 to 4800 to 2400 to 1200 to 300 bps.
#A1 selects initial handshake at 33,600 bps only.
#A2 selects initial handshake at 33,600 to 31,200 to 28,800 to 24000 to 21600 to 19,200 to 16,800 19,200 to 14,400 to 9600 to 4800 bps.
#A3 selects initial handshake at 2400 to 1200 to 300 bps.

COMMAND: ***&B***n
VALUES: ***n = 0 or 1***
DEFAULT: ***&B0***
DESCRIPTION:

&B0 selects normal transmit buffer size.
&B1 selects reduced transmit buffer size.

COMMAND: ***&BS***n
VALUES: ***n = 0 or 1***
DEFAULT: ***&BS1***
DESCRIPTION:

&BS0 selects maximum transmit block size of 64 characters.
&BS1 selects maximum transmit block size of 256 characters (MNP mode)/128 characters (LAP-M mode).

COMMAND: ***B***n
VALUES: ***n = 0 or 1***
DEFAULT: ***B0***
DESCRIPTION:

B0 selects V.21 for 300 bps operation.
B1 selects for 300 bps operation.
(Not used in International Models.)

COMMAND: ***$BA***n
VALUES: ***n = 0 or 1***
DEFAULT: ***$BA0***
DESCRIPTION:

$BA0 selects speed conversion on.
$BA1 selects speed conversion off.

COMMAND: ***&C***n
VALUES: ***n = 0, 1, 2 or 4***
DEFAULT: ***&C1***
DESCRIPTION:

&C0 forces Carrier Detect on.
&C1 lets Carrier Detect act normally.
&C2 lets Carrier Detect drop S24 time on disconnect.
&C4 resets modem when Carrier Detect drops.

COMMAND: ***&CD***n
VALUES: ***n = 0 or 1***
DEFAULT: ***&CD0***
DESCRIPTION:

&CD0 execute cleardown on disconnect.
&CD1 do not execute cleardown on disconnect.

COMMAND: ***D***s
VALUES: ***s = phone #***
DEFAULT: ***n/a***
DESCRIPTION:

Dial a telephone number ***"s"***, where s may include up to 60 digits or T, P, R, comma and ; characters.

COMMAND: ***D***s***N***d
VALUES: ***s = phone # and d = 0 thru 9***
DEFAULT: ***n/a***
DESCRIPTION:

Store telephone number. To store, phone number ***"s"*** is en entered and followed by N and then Directory Number ***"d."***

COMMAND: ***&D***n
VALUES: ***n = 0 thru 3***
DEFAULT: ***&D2***
DESCRIPTION:

&D0 means DTR is ignored
&D1means modem returns to command mode.
&D2 lets modem react to DTR normally.
&D3 causes modem to reset to modem default parameters.

COMMAND: ***$D***n
VALUES: ***n = 0 or 1***
DEFAULT: ***$D0***
DESCRIPTION:

$D0 disables DTR Dialing.
$D1 enables DTR Dialing.

COMMAND: ***%DF***n
VALUES: ***n = 0 or 1***
DEFAULT: ***%DF0***
DESCRIPTION:

%DF0 selects V.34 Line Probe Data in Graph Format.
%DF1 selects V.34 Line Probe Data in Table Format.

COMMAND: ***%DP***n
VALUES: ***n = 0 or 1***
DEFAULT: ***%DP0***
DESCRIPTION:

%DP0 selects not to read Line Probe Information from DSP during handshaking.
%DP1 selects read Line Probe Information from DSP during handshaking.

COMMAND: ***>DT***n
VALUES: ***n = 0 or 1***
DEFAULT: ***>DT0***
DESCRIPTION:

>DT0 disables modem detecting DTMF tones.
>DT1 enables modem detecting and reporting DTMF tones when it is off-hook.

COMMAND: ***E***n
VALUES: ***n = 0 or 1***
DEFAULT: ***E1***
DESCRIPTION:

E0 selects do not echo Command mode characters.
E1 selects echo Command mode characters.

COMMAND: ***$EB***n
VALUES: ***n = 0 or 1***
DEFAULT: ***$EB0***
DESCRIPTION:

$EB0 selects 10 bit mode.
$EB1 selects 11 bit mode.

COMMAND: ***&E***n
VALUES: ***n = 0 thru 15***
DEFAULT: ***&E1, &E4, &E6, &E10, &E13, &E15***
DESCRIPTION:

&E0 selects no error correction.
&E1 selects V.42 Auto-reliable Mode.
&E2 selects V.42 Reliable Mode.

COMMAND: ***&E***n (Cont'd)
&E3 selects no modem-initiated flow control.
&E4 selects CTS modem-initiated flow control.
&E5 selects Xon/Xoff modem-initiated flow control.
&E6 selects Xon/Xoff not passed through.
&E7 selects Xon/Xoff passed through.
&E8 selects Enq/Ack pacing off.
&E9 selects Enq/Ack pacing on.
&E10 selects Normal Mode flow control off.
&E11 selects Normal Mode flow control on.
&E12 selects Pacing off.
&E13 means Pacing on.
&E14 means data compression disabled.
&E15 means data compression enabled.

COMMAND: ***%E***n
VALUES: ***n=0 thru 5***
DEFAULT: ***%E1***
DESCRIPTION:
%E0 = Modem Won't Escape.
%E1 = +++ Method (default setting).
%E2 = Break Method.
%E3 = Either +++ or Break Method.
%E4 = No "OK" Response to +++
%E5 = "OK" Response to +++

COMMAND: ***#F***n
VALUES: ***n = 0 thru 2***
DEFAULT: ***#F2***
DESCRIPTION:
#F0 means no fallback when on-line.
#F1 means fallback from 33600 to 4800 bps when on-line (increments of 2400 bps).
#F2 means fallback to 4800 bps from 33.6K bps/fall forward if line improves (increments of 2400 bps).

COMMAND: ***&F***n
VALUES: ***n = 0, 8 or 9***
DEFAULT: ***&F8***
DESCRIPTION:
&F loads factory default values from ROM.
&F8 reads factory default values when &F is issued.
&F9 reads parameters stored in nonvolatile memory when &F is issued.

COMMAND: ***$F***n
VALUES: ***n = 0 or 1***
DEFAULT: ***$F1***
DESCRIPTION:

$F0 selects do not fall back to normal connect if CR received.
$F1 selects fall back to normal connect if CR received.

COMMAND: ***&G***n
VALUES: ***n = 0, 1 or 2***
DEFAULT: ***&G0***
DESCRIPTION:

&G0 turns off CCITT guard tones.
&G1 turns on CCITT 550 Hz guard tone.
&G2 turns on CCITT 1800 Hz guard tone. (Not used in International models.)

COMMAND: ***H***n
VALUES: ***n = 0 or 1***
DEFAULT: ***n/a***
DESCRIPTION:

H0 selects Hang Up (go on hook).
H1 selects Go Off Hook.

COMMAND: ***$H***n
VALUES: ***n = 1 thru 3***
DEFAULT: ***Read Only Command***
DESCRIPTION:

$H1 selects Help Screen #1.
$H2 selects Help Screen #2.
$H3 selects Help Screen #3.

COMMAND: ***I***n
VALUES: ***n = 0,1, 2, 3 or 5***
DEFAULT: ***Read Only Command***
DESCRIPTION:

I0 requests modem ID #.
I1 requests firmware revision #.
I2 for Model of modem.
I3 MTS internal use.
I5 outputs DSP version.

COMMAND: ***I9***
VALUES: ***N/A***
DEFAULT: ***Read Only Command***
DESCRIPTION:

The ***I9*** command is a query to display this modem's characteristics when operating within Windows 95. Entering ***ATI9***<cr> invokes *ZPX 28800 FAX CT* on your video monitor.
(The response to the query reveals that this modem is a ZPX, 28.8K, FAX and Class Two capable device.)

COMMAND: ***L***
VALUES: ***5, 6, 7, 8, 9, 10 and 11***
DEFAULT: ***Read Only Command***
DESCRIPTION:

L5 lists all current operating parameters.
L6 lists all current S-Register values.
L7 lists additional parameters.
L8 lists current on-line diagnostics.
L9 displays Signal Strength Information.
L10 displays Signal to Noise Ratio Information.
L11 displays Noise Information.

COMMAND: ***#L***n
VALUES: ***n = 0 thru 3***
DEFAULT: ***#L0***
DESCRIPTION:

#L0 selects modems to negotiate V.42 Mode.
#L1 selects MNP on and LAP-M off.
#L2 selects LAP-M on and MNP off.
#L3 selects no detection phase, go directly to LAP-M.

COMMAND: ***$MB***n
VALUES: ***n = speed***
DEFAULT: ***$MB33600 bps***
DESCRIPTION:

$MB75 selects CCITT V.23 mode.
$MB300 selects 300 bps on-line.
$MB1200 selects 1200 bps on-line.
$MB2400 selects 2400 bps on-line.
$MB4800 selects 4800 bps on-line.
$MB9600 selects 9600 bps on-line.
$MB14400 selects 14400 bps on-line.
$MB19200 selects 19200 bps on-line.
$MB28800 selects 28800 bps on-line.
$MB33600 selects 33600 bps on-line.

COMMAND: ***N***d
VALUES: ***d = 0 thru 9***
DEFAULT: ***n/a***
DESCRIPTION:

Dial stored telephone number ***"d"*** (Do not include the letter D in this command.)

COMMAND: ***N***d***N***e
VALUES: ***d = 0 thru 9; e = any other number 0 thru 9***
DEFAULT: ***n/a***
DESCRIPTION:

Number Linking. If first number dialed is busy, another stored number may be automatically dialed.

COMMAND: ***O***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Exit Command Mode and go into On-Line Mode.

COMMAND: ***P***
VALUES: ***n/a***
DEFAULT: ***Tone Dial***
DESCRIPTION:

Modem will pulse-dial numbers following the P.

COMMAND: ***&P***n
VALUES: ***n = 0 or 1***
DEFAULT: ***&P1***
DESCRIPTION:

&P0 selects 60-40 pulse ratio.
&P1 selects 67-33 pulse ratio.

COMMAND: ***Q***n
VALUES: ***n = 0, 1 or 2***
DEFAULT: ***Q0***
DESCRIPTION:

Q0 means Result Codes sent.
Q1 means Result Codes will be suppressed (quiet).
Q2 means Dumb Answer Mode.

COMMAND: ***&Q***n
VALUES: ***n = 0 or 1***
DEFAULT: ***&Q0***
DESCRIPTION:

&Q0 selects Multi-Tech command set.
&Q1 selects AT command set.

COMMAND: ***R***n
VALUES: ***n = 0 or 1***
DEFAULT: ***R0***
DESCRIPTION:

R0 selects modem will not reverse modes.
R1 selects modem will reverse modes.

COMMAND: ***&R***n
VALUES: ***n = 0, 1 or 2***
DEFAULT: ***&R1***
DESCRIPTION:

&R0 lets Clear to Send act normally.
&R1 forces Clear to Send on in Command Mode.
&R2 drops for 1 second on disconnect.

COMMAND: ***$Rn***
VALUES: ***n = 0 or 1***
DEFAULT: ***$R0***
DESCRIPTION:

$R0 selects disconnect after 12 retransmits.
$R1 selects do not disconnect after 12 retransmits.

COMMAND: ***&RF***n
VALUES: ***n = 0 or 1***
DEFAULT: ***&RF1***
DESCRIPTION:

&RF0 selects CTS follows RTS.
&RF1 selects CTS to act independently

COMMAND: ***Sr=n***
VALUES: ***r = 0-11, 13, 15-17, 24-26, 29, 30, 32, 34, 36, 37, 48***
DEFAULT: ***n/a***
DESCRIPTION:

Sets value of S-Register ***"r"*** to value of ***"n"***, where ***"n"*** is entered in decimal format.

COMMAND: ***S***r?
VALUES: ***r = 0-11, 13, 15-17, 24-26, 29, 30, 32, 34, 36, 37, 48***
DEFAULT: ***n/a***
DESCRIPTION:

Reads value of S-Register ***"r"*** and displays value in 3-digit decimal format.

COMMAND: ***$SBn***
VALUES: ***n = speed***
DEFAULT: ***$SB115200 bps***
DESCRIPTION:

$SB300 selects 300 bps at serial port.
$SB1200 selects 1200 bps at serial port.
$SB2400 selects 2400 bps at serial port.
$SB4800 selects 4800 bps at serial port.
$SB9600 selects 9600 bps at serial port.
$SB19200 selects 19,200 bps at serial port.
$SB38400 selects 38,400 bps at serial port
$SB57600 selects 57600 bps at serial port.
$SB115200 selects 115200 bps at serial port.

COMMAND: ***&SFn***
VALUES: ***n = 0 or 1***
DEFAULT: ***&SF0***
DESCRIPTION:

&SF0 selects DSR follows CD.
&SF1 selects DSR independent.

COMMAND: ***&Sn***
VALUES: ***n = 0, 1 or 2***
DEFAULT: ***&S1***
DESCRIPTION:

&S0 forces Data Set Ready On.
&S1 lets Data Set Ready act normally.
&S2 Data Set Ready drop is regulated by S24 on disconnect.

COMMAND: ***T***
VALUES: ***n/a***
DEFAULT: ***Tone Dial***
DESCRIPTION:

Modem will tone-dial numbers following the T.

COMMAND: ***&Tn***
VALUES: ***n = 4 or 5***
DEFAULT: ***&T5***
DESCRIPTION:

&T4 selects Enable Response to Request for Remote Digital Loopback.
&T5 selects Disable Response to Request for Remote Digital Loopback.

COMMAND: ***$Tn***
VALUES: ***n = 1 or 2***
DEFAULT: ***$T1***
DESCRIPTION:

$T0 selects calling tones on (1300 Hertz data/modem mode only).
$T1 selects calling tones off (1300 Hertz data/modem mode only).

COMMAND: ***#Tn***
VALUES: ***n = 0 or 1***
DEFAULT: ***#T1***
DESCRIPTION:

#T0 turns off Trellis Coded Modulation
#T1 turns on Trellis Coded Modulation

COMMAND: ***Un***
VALUES: ***n = 0, 1, 2, or 3***
DEFAULT: ***n/a***
DESCRIPTION:

U0 places modem in Analog Loop Originate Mode.
U1 places modem in Analog Loop Answer Mode.
U2 places modem in Remote Digital Loopback test mode.
U3 places modem in Local Digital Loopback Test Mode.

COMMAND: ***Vn***
VALUES: ***n = 0 or 1***
DEFAULT: ***V1***
DESCRIPTION:

V0 selects Result Codes sent as digits(terse response).
V1 selects Result Codes sent as words (verbose response).

COMMAND: ***#Vn***
VALUES: ***n = 0 or 1***
DEFAULT: ***#V1***
DESCRIPTION:

User can bypass V.32terbo handshaking process.
#V0 selects V.32terbo enabled in originate/answer modes.
#V1 selects V.32terbo disabled in originate/answer modes.

COMMAND: ***W***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Wait for new dial-tone.

COMMAND: ***&Wn***
VALUES: ***n = 0 or 1***
DEFAULT: ***&W1***
DESCRIPTION:

&W0 causes modem to store its current parameters in nonvolatile RAM, and modem will load these for future sessions instead of reading factory ROM defaults, unless &F command used.
&W1 causes modem to not store parameters.

COMMAND: ***Xn***
VALUES: ***n = 0, 1, 2, 3 or 4***
DEFAULT: ***X0***
DESCRIPTION:

X0 selects Basic Result Codes (w/o CONNECT 1200, CONNECT 2400).
X1 selects Extended Result Codes (w/CONNECT 1200, CONNECT 2400).
X2 selects Standard AT Command set with NO DIAL TONE.
X3 selects Standard AT Command set with BUSY.
X4 selects Standard AT Command set with NO DIAL TONE and BUSY.

COMMAND: ***#Xn***
VALUES: ***n = 0 or 1***
DEFAULT: ***#X0***
DESCRIPTION:

#X0 selects single XOFF character sent until XON level returns.
#X1 selects multiple XOFF characters after buffer level is full.

COMMAND: ***Yn***
VALUES: ***n = 0 or 1***
DEFAULT: ***Y0***
DESCRIPTION:

Y0 disables sending or responding to long space “break”.
Y1 enables sending or responding to long space “breaks”.

COMMAND: ***Z***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

All configuration parameters are reset to default values.

COMMAND: ***, (Comma)***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Causes pause during dialing.

COMMAND: ***;(Semi-Colon)***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Causes return to Command Mode after dialing.

COMMAND: ***! (Exclamation)***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Causes modem to flash On-Hook.

COMMAND: ***@***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Causes modem to wait for ringback, then 5 seconds of silence before processing next part of command.

COMMAND: ***+++AT<CR>***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

In-band Escape Sequence. Places modem in Command mode while still remaining On-Line. Enter +++ followed by the letters A and T, up to ten command characters, and a RETURN.

COMMAND: ***BREAK AT<CR>***
VALUES: ***n/a***
DEFAULT: ***n/a***
DESCRIPTION:

Out-of-band Escape Sequence. Places modem in Command mode while still remaining On- Line. Not preceded by AT. Enter a BREAK signal, followed by the letters A and T, up to sixty command characters, and hit RETURN.

Remote Configuration

The Remote Configuration feature is a network management tool that allows you to configure modems remotely. This means you could configure modems anywhere in your network from one location without having to visit the sites or rely on remote users to follow your instructions. With Remote Configuration, which is protected by two level security, you can downline load new parameters, program new V.42 capabilities and implement new features. Remote Configuration also makes troubleshooting a remote location a lot easier.

The way Remote Configuration works is that S-Register S13 has been set-up to contain the special Remote Configuration escape code. When calling a Remote Configuration equipped modem, you enter the proper Remote Escape code to enable entering your Set-up Password. After entering it, you can then execute AT commands as if you were connected locally. If you set S-Register S13 to zero, Remote Configuration is disabled.

Remote Configuration Procedures

The procedures for using the Remote Configuration features are the same whether or not a call originates from the remote modem. Once the modem is on-line, perform the procedures in Table 4-1.

TABLE 4-1. Remote Configuration Operation Procedures

Step	Procedure
1.	Remote Escape Configuration requires %%%<CR> to be sent if the default value in S-Register S13 has not been changed. The modem responds with: *1. - DATA Mode* *2. - COMMAND Mode*
2.	You then select 1 or 2 . With 1, the modem goes back into data mode and with 2, the modem responds with the following: *Password>*
3.	Enter your Set-up Password, and if the code is correct the modem responds with: *OK*

TABLE 4-1 (Cont'd). Remote Configuration Operation Procedures

You can now use any AT commands of the modem being remotely configured as if they were being entered locally. You cannot change the Set-up of the LOGIN Password until you enter the proper LOGIN Password.

Step	Procedure

4. When you are done entering AT commands and you want to exit, type ***AT0*** and hit RETURN. The modem responds with:

   1. DATA Mode

   2. COMMAND Mode

5. Enter a 1 to go back on-line with your computer, or enter 2 and the correct password to talk to your modem.

Password Commands

COMMAND: ***#Ixxxxxxxxxx***
VALUES: ***n/a***
DEFAULT: ***#IMULTITECH***
DESCRIPTION:

Login Password is any keyboard characters (x) (upper/lower case sensitive), minimum 6 and maximum 10 characters. The default Login Password is #IMULTITECH.

COMMAND: ***#Syyyyyyyyyy***
VALUES: ***n/a***
DEFAULT: ***#SMODEMSETUP***
DESCRIPTION:

Set-up Password is any keyboard characters (y) (upper/lower case sensitive), minimum 6 and maximum 10 characters. The default Set-up Password is #SMODEMSETUP.

S-Registers

Certain Command Mode configurations are stored in memory registers called, S-Registers. The ***S*** command is used to assign a value to, and to read the current value of an S-Register. To assign a value to an S-Register, enter the letter ***S***, followed by the S-Register number and an equals sign (*=*). To read an S-Register value, enter the letter ***S*** followed by the S-Register number and a question mark (*?*), then hit RETURN. To verify that the S-Register value was entered correctly, enter for example, ***ATS8?*** and hit RETURN. You should receive a response of the assigned value given to that S-Register.

S0

Number of Rings Until Modem Answers

Unit: 1 ring
Range: 0-255
Default: 0
Description: Sets the number of rings before the modem answers.

S1

Rings Which Have Occurred

Unit: 1 ring
Range: 0-255
Default: 0
Description: Counts the number of rings that have occurred.

S2

Escape Code Character

Unit: ASCII Character
Range: 0-127
Default: 43 (*+ sign*)
Description: Defines the escape code character.

S3

Return Character

Unit: ASCII Character
Range: 0-127
Default: 13
Description: Defines the character recognized as Carriage Return (RETURN) or “Enter”.

S4

Line Feed Character

Unit: ASCII Character
Range: 0-127
Default: 10
Description: Defines the character recognized as LINE FEED.

S5

Backspace Character

Unit: ASCII Character
Range: 0-127
Default: 8
Description: Defines the character recognized as BACKSPACE.

S6

Wait Time for Dial Tone

Unit: 1 second
Range: 2-255, 4-255**
Default: 2, 4**
Description: Sets the time the modem waits after the RETURN key is pressed before executing a dial command.

S7

Time for Carrier (Abort Timer)

Unit: 1 second
Range: 1-255, 1-45*
Default: 45
Description: Defines the Abort Timer (lack of carrier) delay time.

* Value for International and DOC units
** Value for International Units only

S8

Pause Time for Comma

Unit: 1 second
Range: 0-255, 4-255**
Default: 2, 4**
Description: Sets the length of the pause caused by a comma inserted in a dialing command.

S9

Carrier Detect Response Time

Unit: 100 mSec.
Range: 1-255
Default: 6
Description: Sets the time delay for when the modem first detects a valid incoming carrier signal and when the modem turns on its Carrier Detect circuit.

S10

Carrier Loss Disconnect Delay Time

Unit: 100 mSec.
Range: 0-255
Default: 7
Description: Sets the time a carrier signal must be lost before the modem disconnects.

S11

Tone Dialing: Tone Spacing and Duration

Unit: 1 mSec.
Range: 1-255, 80-255*
Default: 70, 80*
Description: Sets the time duration of spacing between tone in tone-dialing.

* Value for International and DOC units
** Value for International Units only

S13

Remote Configuration Escape Character

Unit: ASCII Character
Range: 0-127
Default: 37 (*% sign*)
Description: Defines the remote configuration escape character.

S17

Changing Break Time

Unit: 10 mSec.
Range: 0-2.5 sec
Default: 250
Description: S17 defines the break time (space) to local PC.

S24

PBX/CBX Disconnect Drop Time for DSR/CTS/CD

Unit: 50 mSec.
Range: 0-255
Default: 20
Description: Defines DSR/CTS/CD dropout time. The default of 20 equals one second.

S25

DTR Dropout Time

Unit: 100 mSec.
Range: 0, 1 through 255
Default: 0
Description: Defines DTR dropout time. 0 default equals 50ms.

S26

Failed Password Attempts

Unit: 1 failed attempt
Range: 0-255
Default: 0
Description: Counts the number of times there has been a failed password attempt.

S29

Local Inactivity Timer

Unit: minutes
Range: 1-255
Default: 20
Description: Defines the amount of idle time that can elapse between AT commands after the SETUP password has been entered.

S30

Inactivity Timer

Unit: 1 minute
Range: 0-255
Default: 0
Description: Inactivity timer used to disconnect the modem.

S32

Time Elapse for Escape Sequence

Unit: 1 second
Range: 0-255
Default: 20
Description: Sets the duration in which modem waits for a <CR> to be entered during escape sequence execution.

S34

Buffer Length of Command Mode...After On-line Escape Sequence

Unit: ASCII Character
Range: 0-60
Default: 10
Description: Sets buffer length of command mode after on-line escape sequence.

S36

Time Between DTR Inactive and Modem Off-Hook

Unit: 1 Second
Range: 0-255 seconds
Default: 0
Description: Sets the time between DTR inactive (low) and the modem going *off-hook*. The DTR Busy-out feature is disabled with S36=0.

S37

Time Between DTR Active and Modem On-Hook

Unit: 1 Second
Range: 0-255 seconds
Default: 5
Description: Sets the time between DTR being active and the modem going *on-hook* (not busy).

S48

Program V.34 Connect Speeds

Unit: N/A
Range: 33, 31, 28, 26, 21, 19, 16, 14, 12, 9 and 4
Default: 0
Description: Defines which speed modem connects within V.34 mode scope (e.g., S48 = 21 means maximum connect speed is 21.6K). This register compensates for line conditions that will not support higher V.34 speeds (e.g., 33.6K, 31.2K, 28K, 26.4K, 24K...). The modem default is a value of 0, which indicates a connection attempt of 33.6K.

Result Codes

The MT2834ZPX Command mode provides you with several responses, or *"Result Codes"*, that can aid you in Command mode operation. These Result Codes are displayed on your video monitor.

AT&Q0 selects Multi-Tech responses with Reliable/LAP-M/ Compressed modifiers. The terse result code for *CONNECT 2400* is *9.*

AT&Q1 selects Standard AT command set responses. The terse result code for *CONNECT 2400* is *10*. The following tables list result codes generated by the ***&Q*** command.

Table 4-2 &Q0 "Multi-Tech" Result Codes

TERSE	VERBOSE
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5*	CONNECT 1200
6	NO DIALTONE
7	BUSY
8	NO ANSWER
9*	CONNECT 2400
11*	CONNECT 4800
12*	CONNECT 9600
13*	CONNECT 14400
19*	CONNECT 19200
21*	CONNECT 21600
24*	CONNECT 24000
26*	CONNECT 26400
28*	CONNECT 28800
31*	CONNECT 31200
33*	CONNECT 33600

* With MNP error correction on, RELIABLE (or R) is added to these result codes. With LAP-M error correction on, LAP-M (or L) is added to these result codes. With data compression on, COMPRESSED (or C) is added. (Note these *"Extended"* Result Codes are displayed when your modem is set-up to do so with an X1, X2, X3, or X4 command.)

Table 4-3 &Q1 "Standard AT" Result Codes

TERSE	VERBOSE
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5	CONNECT 1200
6	NO DIAL TONE
7	BUSY
8	NO ANSWER
10	CONNECT 2400
11	CONNECT 4800
12	CONNECT 9600
13	CONNECT 14400
19	CONNECT 19200
21	CONNECT 21600
24	CONNECT 24000
26	CONNECT 26400
28	CONNECT 28800
31	CONNECT 31200
33	CONNECT 33600

*Error Correction/Data Compressed modifiers are not displayed with Standard AT Result Codes.

AT Commands and S-Register Summary

The vast majority of installations are similar, with the MT2834ZPX being used to dial up a remote installation where the call is automatically answered. Your MT2834ZPX has a default configuration to dial another 33,600 bps modem that support error correction, data compression and flow control. If the answering modem is not compatible, the MT2834ZPX can match protocols, provided the protocols are industry standard (i.e., ITU-T, AT&T or Bell) and not proprietary.

AT&W0 (or **AT&W**) command, used in conjunction with specific other AT commands and S-Registers, can reconfigure the MT2834ZPX to conform to a specific application. The MT2834ZPX can store its configuration parameters and S-Register values in its nonvolatile memory (RAM). This command also sets the modem upon power up, or when it is reset with an **ATZ** command, the modem reads all its configuration and S-Register parameters from RAM, and not from the factory settings in ROM (note you may recall factory installed defaults by entering **AT&F8&W0**).

The **&W** command changes the configuration parameters stored in RAM that you specifically intend to alter. All other default parameters remain unchanged.

The **AT&W1** command sets the modem so that it does not store its parameters in RAM, and on power up or when an **ATZ** command is issued, parameters are read from the factory default settings in ROM.

You may first view the modem's current operating parameters by using the **ATL5**, **ATL6** and **ATL7** commands to display the current modem configuration; then alter the modem's configuration settings if your application requires you to do so.

Chapter 5 - Troubleshooting

Troubleshooting

Your MT2834ZPX was thoroughly tested at the factory before it was shipped. If you are unable to make a successful connection or if you experience data loss or garbled characters during your connection, it is possible that the modem is defective. However, it is more likely that the source of your problem lies elsewhere. Problems you may encounter include the following:

- The modem does not respond to commands.
- The modem dials but is unable to make a connection.
- The modem disconnects while online.
- The modem cannot connect when answering.
- File transfer is slower than it should be.
- Losing data.
- Getting garbage characters on the monitor.
- Can't run fax and communications software at the same time.

If you experience problems, please check the following possibilities before calling Tech Support (see Chapter 7).

The Modem Does Not Respond to Commands

- Make sure you are issuing the modem commands from the data communications software, either manually in terminal mode or automatically by configuring the software. (You cannot send commands to the modem from the DOS prompt.)
- Make sure you are in terminal mode in your data communications program, then type **AT** and press ENTER. If you get an *OK* response, your connections are good and the problem likely is in your phonebook entry or session settings.
- Try resetting your modem by turning it off and on. Make sure there is a reset command (**&F**) in your initialization string, or your modem may not initialize correctly.
- If you don't get an *OK*, the problem may still be in the communications software. Make sure you have done whatever is necessary in your software to make a port connection. Not all communications programs connect to the COM port automatically.

Some connect when the software loads and remain connected until the program terminates. Others, like MultiExpress Terminal, can disconnect without exiting the program (make sure the Connect icon looks plugged in). MultiExpress Terminal also allows multiple terminals to be open, but only one can access the modem at a time. If MultiExpress Terminal reports that it cannot make a connection, click on the Window menu to see if more than one terminal is open.

- Your communications software settings may not match the port the modem is connected to. Or you may have selected a COM port in your software other than the one the modem is connected to—compare the settings in your software to the connection.
- Peripheral expansion cards, such as bus mouse and sound cards, may include a serial port preconfigured as COM1 or COM2. The extra serial port, or the card itself, may use the same COM port, memory address, or interrupt request (IRQ) as your communications port. Be sure to disable any unused ports.

  To look for address or IRQ conflicts if you use Windows 3.1x, select File, Run in Program Manager, type **MSD**, and press ENTER. Then select Mouse, COM Ports, and IRQ Status and note the addresses and IRQs that are in use. If you find an IRQ conflict, note which IRQs are not being used, then change one of the conflicting devices to use one of the unused IRQs. If you find an address conflict, change the address of one of the conflicting devices.

  To change a port address or IRQ in Windows 3.1x, double-click the Control Panel icon, then the Ports icon. Click on the port you want to change, click Settings, click Advanced, and select the new port address and/or interrupt. If you wish to use COM3 or COM4, note that COM3 shares an IRQ with COM1, as does COM4 with COM2, so you should change their IRQs to unused ones, if possible.

  If you use Windows 95, right-click on *My Computer*, select *Properties* from the menu, click on the *Device Manager* tab, double-click on *Ports*, then double-click on the *Communications Port* your modem is connected to. In the port's *Properties* sheet, click on the *Resources* tab to see the port's Input/Output range and Interrupt Request. If another device is using the same address range or IRQ, it will appear in the Conflicting Device List.

Uncheck Use Automatic Settings to change the port's settings so they do not conflict with the other device, or select the port the conflicting device is on and change it instead. If you need to open your computer to change switches or jumpers on the conflicting device; refer to the device's documentation.

- The modem may be defective. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, the first modem is possibly defective. Call Tech Support for assistance (see Chapter 7).

The Modem Dials But Cannot Make a Connection

There can be several reasons the ZPX fails to make a connection. Possibilities include

- lack of a physical connection to the telephone line.
- a wrong dial tone.
- a busy signal.
- a wrong number.
- no modem at the other end.
- a faulty modem, computer, or software at the other end.
- incompatibility between modems.

You can narrow the list of possibilities by using extended result codes. To enable them, enter **ATV1X4** and press ENTER while in terminal mode, or include **V1X4** in the modem's initialization string. When you dial again, the modem will report the call's progress.

- If the modem reports NO DIALTONE, check that the modem's telephone line cable is connected to both the modem's LINE jack (not the PHONE jack) and the telephone wall jack. If the cable looks secure, try replacing it. If that doesn't work, the problem may be in your building's telephone installation. To test the building installation, plug a telephone into your modem's telephone wall jack and listen for a dial tone. If you hear a dial tone, your modem may be installed behind a company phone system (PBX) with an internal dial tone that sounds different from the normal dial tone. In that case, the modem may not recognize the dial tone and may treat it as an error.

  Check your PBX manual to see if you can change the internal dial tone; if you can't, change your modem's initialization string to replace **X4** with **X3**, which will cause the modem to ignore dial tones.

- If the modem reports BUSY, the other number may be busy, in which case you should try again later, or it may indicate that you have failed to add a **9,** prefix to the phone number if you must dial *9* for an outside line.

  If you must dial *9* to get an outside line, the easiest way to dial it automatically is to include it in the modem's dial prefix, e.g., **ATDT9,**. Note the comma, which inserts a pause before the number is dialed. By inserting **9,** into the dial prefix, you do not have to include it in each directory entry in MultiExpress Terminal.

  To change the dial prefix in MultiExpress Terminal, select *Setup*, *Modem*; then select the modem type you are using, and type the new prefix in the Dial Prefix box. To change the dial prefix in Windows Terminal, select Settings, Modem Commands. To change it in Windows 95 HyperTerminal, select Call, Connect from the menu bar, click Dialing Properties, and type **9** in the local and long distance boxes in How I Dial from This Location.
- If the modem reports *NO ANSWER*, the other system has failed to go off-hook, or you might have dialed a wrong number. Check the number.
- If the modem reports *NO CARRIER*, the phone was answered at the other end, but no connection was made. You might have dialed a wrong number, and a person answered instead of a computer, or you might have dialed the correct number but the other computer or software was turned off or faulty. Check the number and try again, or try calling another system to make sure your modem is working. Also, try calling the number on your telephone. If you hear harsh sounds, then another modem is answering the call, and the modems may be having problems negotiating because of modem incompatibilities or line noise. Try connecting at a lower speed.

The Modem Disconnects While Online

- If you have call waiting on the same phone line as your modem, it may interrupt your connection when someone tries to call you. If you have call waiting, disable it before each call. In most telephone areas, you can disable call waiting by preceding the telephone number with ***70** (check with your local telephone company).

  You can automatically disable call waiting by including the disabling code in the modem's dial prefix (e.g., **ATDT*70,**—note the comma, which inserts a pause before the number is dialed). To change the dial prefix in MultiExpress Terminal, select *Setup*, *Modem*; then select the modem type you are using, and type the new prefix in the Dial Prefix box. To change the dial prefix in Windows Terminal, select Settings, Modem Commands. To change it in Windows 95 HyperTerminal, select Call, Connect from the menu bar, click Dialing Properties, check this location has Call Waiting, and select the correct code for your phone service.
- If you have extension phones on the same line as your modem, you or someone else can interrupt the connection by picking up another phone. If this is a frequent problem, disconnect the extension phones before using the modem, or install another phone line especially for the modem.
- Check for loose connections between the modem and the computer.
- You may have had a poor connection because of line conditions or the problem may have originated on the other end of the line. Try again.
- If you were online with a BBS, it may have hung up on you because of lack of activity on your part or because you exceeded your time limit for the day. Try again.

The Modem Cannot Connect When Answering

- Auto-answer may be disabled. Turn on auto-answer in your datacomm program or send the command **ATS0=1** to your modem in terminal mode.

File Transfer Is Slower Than It Should Be

- If you are using a slow transfer protocol, such as Xmodem or Kermit, try Zmodem or Ymodem/G instead.
- Is your line noisy? If there is static on your line, the modem has to resend many blocks of data to insure accuracy. You must have a clean line for maximum speed.
- Are you downloading a compressed file with MNP 5 hardware compression enabled? Since hardware data compression cannot compress a file already compressed by an archiving program, the transfer can be marginally slower with data compression enabled than with it disabled.
- Try entering the **L8** (List Online Diagnostics) command in online mode, making a screen print of the diagnostics listing, and checking for parameters that may be unacceptable (number of retrains, round trip delay, etc.).

Losing Data

- If you are using data compression and a high speed serial port, set the serial port baud rate to four times the data rate.
- Make sure the flow control method you selected in software matches the method selected in the modem. If you have a Macintosh, you may have the wrong cable for hardware flow control.
- If you are running under Windows 3.1 and have a 16550AFN UART, you may need to turn on the 16550's data buffers and/or replace the Windows serial driver, COMM.DRV.
- Try entering the **L8** (List Online Diagnostics) command in online mode, making a screen print of the diagnostics listing, and checking for parameters that may be unacceptable (number of retrains, round trip delay, etc.).

Getting Garbage Characters on the Monitor

- Your computer and the remote computer may be set to different word lengths, stop bits, or parities. If you have connected at 8-N-1, try changing to 7-E-1, or vice-versa, using your communications software.
- You may be experiencing line noise. Enable error correction, if it is disabled, or hang up and call again; you may get a better connection.
- At speeds above 2400 bps, the remote modem might not use the same transmission or error correction standards as your modem. Try connecting at a slower speed or disabling error correction. (With no error correction, however, line noise can cause garbage characters.)
- Try entering the **L8** (List Online Diagnostics) command in online mode, making a screen print of the diagnostics listing, and checking for parameters that may be unacceptable (number of retrains, round trip delay, etc.).

Fax and Communications Software Won't Run at the Same Time

Communications devices can be accessed by only one application at a time. Under DOS or Windows 3.1x, you can run either your fax software or your datacomm software, but not both at the same time, unless you have a special communications device management application, such as Multi-Tech's Virtual Modem Driver. In Windows 95, you can have data and fax communication applications open at the same time, but they cannot use the same modem at the same time.

In this test, data from your computer or terminal is sent to your modem's transmitter, converted into analog form, looped back to the receiver, converted into digital form and then received back at your monitor for verification. No connection to the phone line is required. See Figure 6-1 in Chapter 6.

Chapter 6 - Testing Your Modem

Local Analog Loopback Test/V.54 Loop 3

In this test, data from your computer or terminal is sent to your modem's transmitter, converted into analog form, looped back to the receiver, converted into digital form and then received back at your monitor for verification. No connection to the phone line is required. See Figure 6-1.

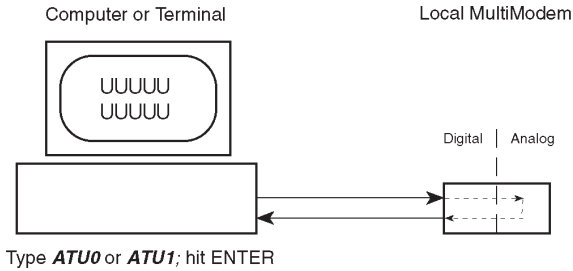


Figure 6-1. Local Analog Loopback Test

The test procedure is as follows:

1. Connect the modem to your computer. With your communication software, set the desired baud rate.
2. Type ***ATU0*** **(or *ATU*)** and hit ENTER. This places your modem in Analog Loopback mode, in the Originate mode. The modem is now out of the Command mode and in a pseudo On-Line mode.
3. Once you receive a connect message (if responses are enabled), enter data from your keyboard. For this test, typing multiple upper case *"U"* characters is a good way to send an alternating test pattern of ones and zeros.
4. For a more complete test, you should also test the modem in Answer mode. To do this, you must “escape” from Originate mode by entering an Escape Sequence (***+++AT<CR>*** or ***<BREAK>AT<CR>***) . Then type ***ATU1*** and hit ENTER to place the modem in Analog Loopback mode, in the Answer mode. Then repeat step 3.

5. Your modem passes this test if the data entered from your keyboard are the same as the data received on your monitor. If different data is appearing on your monitor, your modem is probably causing the problem, although it could also be your computer. If your modem passes this test, but you are receiving errors while On-line, the remote modem or the phone line could be at fault.

Note: All Loopback Tests operate at all speeds except 300 bps; and disable error correction (&E0&W0<cr>) before engaging in loopback tests.

Digital Loopback Test/V.54 Loop 2 (Local/Manual)

The Digital Loopback Test is an on-line test that loops data sent from one modem across the phone line to another modem, then back to the first modem. See Figure 6-2.

There are two ways to put a modem into Digital Loopback mode.

1. Locally or Manually, described here in section 6.2.
2. Remotely or Automatically, see section 6.3.

In this test the local modem is placed in Digital Loopback mode. Data is entered and transmitted from the remote modem (which is not in digital loopback mode), sent across the phone line to the local modem and looped back to the remote modem.

The test procedure is as follows:

1. Go into Terminal mode. Type ***AT*** and hit ENTER; you should get an *OK* message.
2. Dial the remote modem by entering the Dial command and the phone number, to establish On-line mode.
3. Type the Escape Sequence (***+++AT<CR>*** or ***<BREAK>AT<CR>***) which brings your modem into Command mode, while still maintaining the pseudo On-line mode with the remote modem.
4. Type ***ATU3*** from the local PC and hit ENTER. Once you receive an *OK* message from your modem (if responses are enabled), the local modem is placed in Digital Loopback mode.

5. Data is typed from the remote keyboard. For this test, typing multiple upper case *"U"* characters is a good way to send an alternating test pattern of ones and zeros. The data received by the local modem will enter its analog receiver, be converted to digital data, be reconverted into analog, and then looped through its transmitter back to the remote modem. Your modem passes this test if the data entered from the remote keyboard is the same as the data received on the remote monitor.

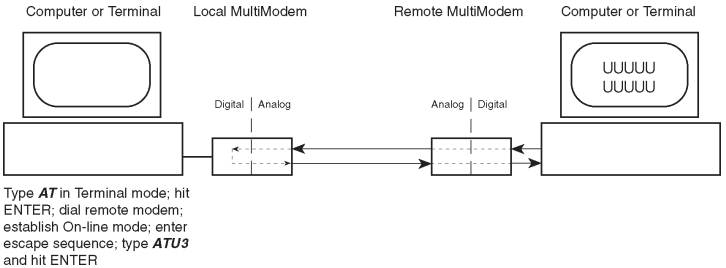

Computer or Terminal
Local MultiModem
Remote MultiModem
Computer or Terminal
UUUUU
UUUUU
Digital | Analog
Analog | Digital
Type AT in Terminal mode; hit ENTER; dial remote modem; establish On-line mode; enter escape sequence; type ATU3 and hit ENTER

Figure 6-2. Digital Loopback Test (local/manual)

6. When testing is complete, you may end the test by typing an Escape Sequence (***+++AT<CR>*** or ***<BREAK>AT<CR>***) to bring your modem into Command mode. The modem should respond with an *OK* message. If you wish to stay On-line with the remote modem for normal data transmission, type ***AT0*** and hit ENTER. If you wish to terminate the call, type ***ATH*** and hit ENTER to hang up.

Digital Loopback Test/V.54 Loop 2 (Remote/ Automatic)

In this test, your modem must be On-line with another modem set up to respond to a request for Digital Loopback (note that some modems may not support Remote Loopback or may have this feature disabled).

The test procedure is as follows:

1. Go into Terminal mode. Type ***AT*** and hit ENTER; you should get an *OK* message.
2. Dial the remote modem by entering the Dial command and the phone number, to establish On-line mode.

Note: The ***&T4*** command must be set on the remote modem to run this test.

3. Type the Escape Sequence (***+++AT<CR>*** or ***<BREAK>AT<CR>***) which brings your modem into Command mode, while still maintaining the connection with the remote modem.

4. Type ***ATU2*** and hit ENTER. The local modem responds to this command by transmitting an unscrambled marking signal, which causes the remote modem to place itself in Digital Loopback mode. Then the local modem exits Command mode and enters pseudo On-line mode.

5. Type data from your keyboard. For this test, typing multiple upper case *"U"* characters is a good way to send an alternating test pattern of ones and zeros. The data received by the remote modem will enter its analog receiver, be converted to digital data, be reconverted into analog, and then looped through its transmitter back to the local modem. Your modem passes this test if the data entered from the local keyboard is the same as the data received on your monitor.

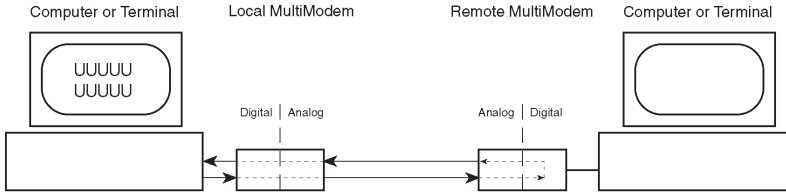


Figure 6-3. Digital Loopback Test (remote/automatic)

Chapter 7 - Service, Warranty and Tech Support

Introduction

This chapter starts out with statements about your modem's 10-year warranty. The next section, Tech Support, should be read carefully if you have questions or problems with your modem. It includes the technical support telephone numbers, space for recording your modem information, and an explanation of how to send in your modem should you require service. The final two sections explain how to use our Bulletin Board Service (*BBS*), and a brief section on the CompuServe/Internet Forums.

Limited Warranty

Multi-Tech Systems, Inc. (*"MTS"*) warrants that its products will be free from defects in material or workmanship for a period of ten years from the date of purchase, or if proof of purchase is not provided, ten years from date of shipment. MTS MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by the customer or any party without MTS's written authorization, or used in any manner inconsistent with MTS's instructions.

MTS's entire obligation under this warranty shall be limited (at MTS's option) to repair or replacement of any products which prove to be defective within the warranty period, or, at MTS's option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS's factory transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PURCHASE PRICE FOR DEFECTIVE PRODUCTS.

On-line Warranty Registration

To register your Multi-Tech product on-line, click on the following link:

http://www.multitech.com/support/register.htm

Tech Support

Multi-Tech has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this unit, call 1-800-972-2439. Please fill out the modem information (below), and have it available when you call. If your modem requires service, the tech support specialist will guide you on how to send in your modem (see Service Section).

Recording Modem Information

Please fill in the following information on your Multi-Tech modem. This will help tech support in answering your questions.

Modem Model No.: _____
Modem Serial No.: _____
Modem Firmware Version: _____
FAX Software Version: _____
DataComm Software Version: _____
COM Port #: _____
IRQ Setting: _____

The modem model and serial numbers are silkscreened on the bottom of your modem. The software versions are printed on the diskette labels. Type **ATI1** to display the modem firmware version.

Please note the status of your modem before calling tech support. This screen messages, diagnostic test results, problems with a specific application, etc. Use the space below to note modem status:

Service

If your tech support specialist decides that service is required, modems may be sent (freight prepaid) to our factory. Return shipping charges will be paid by Multi-Tech Systems (within North America).

Include the following with your modem:

- a description of the problem.
- return billing and return shipping addresses.
- contact name and phone number.
- check or purchase order number for payment if the modem is out of warranty. (The standard repair charge for this modem is $95. This price is valid at the time of this publication but could change in the future. Check with your technical support specialist.)
- if possible, note the name of the technical support specialist with whom you spoke.

If you need to inquire about the status of the returned product, be prepared to provide the **serial number** of the product sent (see previous section).

Send modems to this address:

MULTI-TECH SYSTEMS, INC.
2205 WOODALE DRIVE
MOUNDS VIEW, MINNESOTA 55112
ATTN: SERVICE OR REPAIRS

About the Multi-Tech BBS

For customers who do not have Internet access, Multi-Tech maintains a bulletin board system (BBS) that mirrors its FTP site. Information available from the BBS includes new product information, product upgrade files, and problem-solving tips. The phone number for the Multi-Tech BBS is (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).

The BBS can be accessed by any asynchronous modem operating at 1200 bps to 33,600 bps at a setting of 8 bits, no parity, and 1 stop bit (8-N-1).

To log on to the Multi-Tech BBS

1. Set your communications program to **8-N-1**.
2. Dial our BBS at (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).
3. At the prompts, type your first name, last name, and password; then press ENTER. If you are a first time caller, the BBS asks if your name is spelled correctly. If you answer yes, a questionnaire appears. You must complete the questionnaire to use the BBS on your first call.
4. Press ENTER until the Main Menu appears. From the Main Menu you have access to two areas: the Files Menu and News. For help on menu commands, type **?**.

To Download a file

If you know the file name

1. From the Main Menu, type **F** to access the Files Menu, then type **D**.
2. Enter the name of the file you wish to download from the BBS.
3. If a password is required, enter the password.
4. Answer **Y** or **N** to the automatic logoff question.
5. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
6. If you select Zmodem, the transfer will begin automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most datacomm programs, the PAGE DOWN key initiates the download.)

7. When the download is complete, press ENTER to return to the File Menu.
8. To exit the BBS, type **G** and press ENTER.

If you don't know the file name

1. From the Main Menu, type **F** to access the Files Menu. For a list of file areas, type **L**, press ENTER, then type **L** and press ENTER again. (If you do not type the second *L*, you will list all of the files on the BBS.)
2. Mark each file area you would like to examine by typing its list number and pressing ENTER.
3. Enter **L** to list all the files in the selected file areas. Enter **C** to go forward in the file list and **P** to go back.
4. To mark one or more files for download, type **M**, press ENTER, type the list numbers of the files, and press ENTER again.
5. Enter **D**. You will see a list of the files you have marked. Enter **E** if you would like to edit the list; otherwise enter **D** again to start the download process.
6. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
7. If you select Zmodem, the file will transfer automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most data communications programs, the PAGE DOWN key initiates the download.)
8. When the download is complete, press ENTER to return to the File Menu.
9. To exit the BBS, type **G** and press ENTER.

About CompuServe/Internet

In addition to the BBS, Multi-Tech provides support through CompuServe's Modem Vendor Forum (*GOMODEMVEN*) under *GO MULTITECH*. Refer to your CompuServe documentation for special operating procedures.

Multi-Tech is a commercial provider on the Internet, and we retrieve e-mail messages from the following mailboxes on a periodic basis:

mtsmktg@multitech.com	Marketing Dept.
mtssales@multitech.com	Sales Dept.
international@multitech.com	International Marketing & Sales
writers@multitech.com	Publications Dept.

If you prefer to receive support via the internet you can contact tech support via e-mail at:

http://www.multitech.com/_forms/email_tech_support.htm

Multi-Tech's presence includes a Web site at:

http://www.multitech.com

and an ftp site at:

ftp://ftp.multitech.com

The ftp server mirrors the Multi-Tech BBS.

About the Multi-Tech Fax-Back Service

Multi-Tech's fax-back system provides 24-hour access to sales, marketing, and technical literature. Dial 612-717-5888, follow the voice prompts, and request document number 10 for a catalog of available documents.

For convenience, have your fax number handy: _____

From the catalog of available documents, you can order newsletters, white papers, press releases, etc. from the sales and marketing index (pages 1-4), or order basic modem operation and troubleshooting guides from the technical support and engineering index. Just enter the applicable FB Doc. # from the left column of the catalog.

Appendix A - Technical Specifications

Your MT2834ZPX data/fax modem meets the specifications listed below:

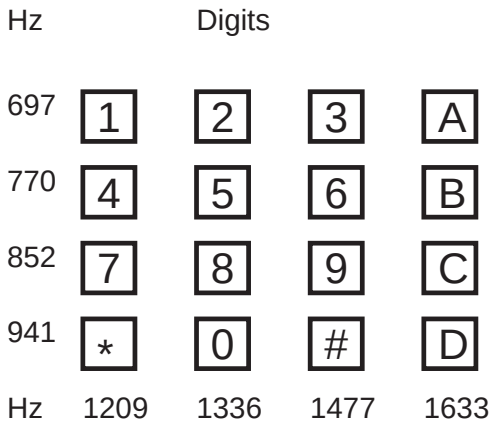
Model Numbers	MT2834ZPX
Data Rates (modem)	33,600, 31,200, 28,800, 26,400, 24,000, 21,600, 19,200, 16,800, 14,400, 12,000, 9600, 7200, 4800, 2400, 1200, 0-300 bps
Data Rates (fax)	14,400, 9600, 7200, 4800 bps
Data Format	Serial, binary, asynchronous at 0-300, 1200, 2400, 4800, 7200, 9600, 14,400, 16,800 or 19,200, 21,600, 24,000, 26,400, 28,800, 31,200, 33,600 bps
Compatibility	ITU V.42*bis*, V.42, Enhanced V.34, AT&T V.32*terbo*, ITU V.32*bis*, V.32, V.21*, V.22*bis*, V.22, V.23*, Bell 212A and 103/113, ITU V.17, Group 3 T.4, T.30 and EIA TR-29 Class 2 (*V.21/ V.23 Int'l models only)
Error Correction	V.42 (LAP-M or MNP 3 & 4) error correction
Data Compression	V.42*bis*, (4:1 throughput) or MNP 5 (2:1 throughput) data compression
Speed Conversion	Serial port data rates adjustable to 300, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600 and 115,200 bps
Flow Control	Xon/Xoff, Hardware RTS/CTS, ENQ/ ACK,
Options	
Mode of Operation	Full duplex over dial-up lines automatic dialing and answer

Intelligent Features	Fully *"AT command"* compatible, microprocessor controlled remote configuration, EIA extended Automode, adaptive line probing, automatic symbol rate and carrier frequency during start-up, retrain and rate renegotiation, autodial, redial, repeat dial, dial linking, pulse or tone dial, dial pauses, call status display, auto-parity and data rate selection, keyboard-controlled modem options, non-volatile memory and on-screen displays for modem option parameters and up to ten telephone numbers/command lines of up to 60 digits each, help menus
Command Buffer	60 characters
Modulation	Trellis Coded Modulation (*TCM*) at 33,600, 31,200, 28,800, 26,400, 24,000, 21,600, 19,200, 16,800, 14,400, 12,000 and 9600 bps, Quadrature Amplitude Modulation (QAM) at 9600 (non-trellis), 4800 and 2400 bps, PSK at 1200 bps, FSK at 300 bps
Fax Modulations	V.21CH2 FSK at 300 bps V.27*ter* DPSK at 4800 and 2400 bps V.29 QAM at 9600 and 7200 bps V.17 TCM at 14400, 12000, 9600, and 7200 bps
Fax Carrier	V.21CH2 (Half Duplex)
Frequencies	1650Hz Mark, 1850Hz Space for Transmit Originate 1650Hz Mark, 1850Hz Space for Transmit Answer V.27*ter* 1800Hz Originate/Answer V.29 QAM 1700Hz Originate/Answer V.17 TCM 1800Hz Originate/Answer

Carrier Frequencies(Data)	1800 Hz V.32/V.32*bis*/V.32*terbo*/ Enhanced V.34 33.6K/31.2K/28.8K/26.4K/24K/21.6K/ 19.2K/16.8K/14.4K/12K/9.6K/4.8K
Carrier Frequencies 2400 & 1200 bps (V.22bis/V.22 or Bell 212A Standard)	Transmit Originate: 1200 Hz Transmit Answer: 2400 Hz Receive Originate: 2400 Hz Receive Answer: 1200 Hz
Carrier Frequencies, 300 bps(Bell Standard)	1270 Hz Mark, 1070 Hz Space for Transmit Originate 2225 Hz Mark, 2025 Hz Space for Receive Originate 2225 Hz Mark, 2025 Hz Space for Transmit Answer 1270 Hz Mark, 1070 Hz Space for Receive Answer
Carrier Frequencies V.21	980 Hz Mark, 1180 Hz Space forTransmit Originate 1650 Hz Mark, 1850 Hz Space for Transmit Answer 1650 Hz Mark, 1850 Hz Space for Receive Originate 980 Hz Mark, 1180 Hz Space for Receive Answer

V.23	390 Hz Mark, 450 Hz Space for Transmit Originate 1300 Hz Mark, 2100 Hz Space for Transmit Answer 1300 Hz Mark, 2100 Hz Space for Receive Originate 390 Hz Mark, 450 Hz Space for Receive Answer
Transmit Level	-10dBm (dial-up)
Frequency Stability	±0.01%
Receiver Sensitivity	-43 dBm under worst case conditions
AGC Dynamic Range	43 dB
Serial Interface	EIA RS232C/ITU V.24 Equivalent
Bus Type	IBM PC Standard ISA or EISA
Berg Jumpers	Select COM1, COM2, COM3 or COM4 communications port option
Berg Jumpers	Select IRQs 2, 3 ,4, 5 and 7 option
Connectors	Two RJ11C connections on modem interface (one for PSTN connection and one for manual dialing and answering via telephone device)
Diagnostics	Local Analog Loop, Local Digital Loop, Remote Digital Loop.
Operating Temperature	0° to 50° C (32° to 120° F)
Power Consumption	1.2 Watts
Dimensions	5.2"L x 3.0"W x .062"D 13.2 cm x 7.62 cm x .165 cm
Weight	4.3 oz. 122 grams
Warranty	10 Years

Appendix B - Tone Dial Frequencies



The tone-dialing method combines two frequencies for each of the twelve digits found on a Touch Tone dial pad. This method is referred to as Dual-Tone Multi-Frequency (*DTMF*) dialing. The four horizontal rows on a Touch-Tone keypad use the four low frequencies (697, 770, 852, 941 Hz), while the three vertical columns use the three high frequencies (1209, 1336, 1477 Hz). The generally accepted tone frequency tolerance is +0.02%.

For example, the digit 4 would be dialed by combining two tone frequencies. It would use the frequency 770 Hz from the second row, and the frequency 1209 Hz from the first column. In another example, the digit 9 would be dialed with the tone frequencies of 852 Hz and 1477 Hz.

The extended DTMF characters (A, B, C, D) are the high-end frequencies (1633 Hz) defined on some telephone sets with a fourth vertical column of buttons. This fourth column provides for extended PBX control functions; the actual functions provided are dependent on the PBX manaufacturer's implementation and feature set.

Appendix C - FCC and Canadian Regulations

FCC Regulations for Telephone Line Interconnection

1. This equipment complies with Part 68 of the Federal Communications Commission (FCC) rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN). If requested, this information must be provided to the telephone company.
2. As indicated below, the suitable jack (Universal Service Order Code connecting arrangement) for this equipment is shown. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.

   An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See installation instructions for details.
3. The ringer equivalence number (REN) is used to determine the quantity of devices which may be connected to the telephone line. Excessive REN's on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the REN's should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total REN's, contact the telephone company to determine the maximum REN for the calling area.
4. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
5. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.

6. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the equipment is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
7. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.
8. This equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. (Contact the state public utility commission, public service commission or corporation commission for information.)
9. If so required, this equipment is hearing-aid compatible.

Manufacturer:	Multi-Tech Systems, Inc.
Model Number:	MT2834ZPX
FCC Registration #:	AU7USA-20673-MM-E
Ringer Equivalence:	0.3B
Modular Jack (USOC)	RJ11C or RJ11W (single line)
Service Center in USA:	Multi-Tech Systems Inc. 2205 Woodale Drive Mounds View, MN 55112 Voice (612) 785-3500/ FAX (612) 785-9874

NOTE: This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that of which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device to send any message via a telephone fax machine unless such message clearly contains in a margin at the top or bottom of each page or the first page of the transmission, the date and time it is sent and an identification of the business or other entity, or other individual sending the message and the telephone number of the sending machine or such business, other entity, or individual. See the cover page of your fax software manual for setup details.

This device complies with Part 15 of the FCC rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian Limitations Notice

Notice: The ringer equivalence number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination of a interface may consist of any combination of devices subject only to the requirement that the sum of the ringer equivalence numbers of all the devices does not exceed 5.

Notice: The Industry Canada label identifies certificated equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Index

Symbols

&E0 20
&E1 20
&E14 19
10/11 bit mode selection 27
16550 UART and Windows 3.1 20

A

Abort Timer
S7 41
About CompuServe 65
About the Multi-Tech BBS 63
AGC Dynamic Range 69
Alternate COM Port/IRQ Settings 11
ASCII code 16
AT command set 32
AT&T's "call card" tones 24
Auto-answer 16, 17

B

Backspace Character 41
Baud rate 17
Bell/V.21 answer tone selection 25
Buffer Length of Command Mode. 44
S34 44
Bulletin Board Systems 15, 18, 19, 21
Bus Type 69
Bypass V.32terbo handshaking process 35

C

Call waiting 53
Calling tones 34
Calling Tones enabled/disabled 34
Canadian Limitations Notice 73

Cannot Make a Connection 51
Carrier Detect 26
Carrier Detect Response Time 42
Carrier Frequencies (Data) 68
Carrier Loss Disconnect Delay Time 42
Changing Break Time 43
Clear to Send 32
Cleardown on disconnect 26
COM ports 17, 21
COMM.DRV 21, 54
Command Buffer 67
Command mode characters control 27
Command string 16
Commands 15, 19, 20
  Non-Error Correction mode 20
  Reliable mode 20
Compatibility 66
CompuServe 20, 21, 65
CompuServe/Internet 65
Configuration Parameters 17
Connectors 69
Continuous redial 24
CTS flow control 28
CTS follows RTS 33
CYBERC.ZIP 21

D

Data Compression 19, 66
  Enabled/disabled 28
Data Format 66
Data Rates 66
Data Rates (fax) 66
Data Rates (modem) 66
Data Set Ready 34
Datacomm software 15, 16, 17, 18, 19, 49
  Configuration 15, 17, 18
Detecting DTMF tones 27
Diagnostics 69

Dialing a stored telephone 31
Dimensions 69
DSR follows CD 33
DTR Control 26
DTR Dialing 26
DTR Dropout Time 43

E

Enq/Ack pacing 28
Error Correction 66
Error correction 20
Escape Code Character 40
Escape modes selection 28
Exit Command Mode 31
Extended DTMF characters 70

F

Factory default values 28
Fax Carrier Frequencies 67
Fax Modulations 67
Fax-Back Service 65
FCC Regulations 71
Features 5
Flash On-Hook 37
Flow Control 66, 54
Flow control selection 28
Frequency Stability 69

G

Garbage Characters 55
Guard tones 29

I

In-band Escape Sequence 37
Inactivity Timer 44
Initialization strings 15, 19, 49, 51
PC-compatible 16

Intelligent Features 67
Interface 69
Internet 65

L

L8 ..... 54, 55
Limited Warranty 60
Line Feed Character 41
S4 41
Line Probe 27
List operating parameters 30
Login Password 39
Long space “break 36
Loopback Test Enabled 35

M

Maximum transmit block size selection 25
MNP 5 ..... 19, 54
Mode of Operation 66
Model Numbers 66
Modem AT Commands 23
Modem baud selection 30
Modem Cannot Connect When Answering 54
Modem Disconnects While Online 53
Modem Does Not Respond to Commands 49
Modem Features 5
Modem ID 29
Modem Initialization Setup 16
Modular phone jack 12
Modulation 67
MT2834BC Printed Circuit Board 11
Multi-Tech BBS 63
Multi-Tech command set 32
Multi-Tech responses 46
"Multi-Tech" Result Codes 46
MultiExpress for Windows 52, 53

N

Negotiate V.42 Mode 30
Noise Information 30
Non-volatile RAM 35
Number Linking 31
Number of Rings Until Modem Answers 45
S0 40

O

Off Hook control 29
Operating Temperature 69
Out-of-band Escape Sequence 37

P

Pacing 28
Parameters 15, 17
Changing defaults 17
Parity 15
Pause during dialing 36
Pause Time for Comma 42
PBX/CBX Disconnect Drop Time for DSR/CTS/CD 43
PC Initialization Strings 16
Power Consumption 69
Product Description 6
Program V34 Connect Speeds 45
Protocols 19, 54
Pulse ratio 32
Pulse-dial 31

R

Read value of Register 33
Receiver Sensitivity 69
Remote Configuration Escape Character 43
Remote Configuration Operation Procedures 38, 39
Remote Digital Loopback 34
Remote System Configuration 18
Repeat last command 24

Rreset default values 36
Result Codes 32, 36
Result codes 16, 51
Result Codes Terse/Verbose selection 35
Retransmit 32
Return Character 41
Return character 16
Return to Command Mode after dialing 37
Rings Which Have Occurred
S1 40

S

S-Registers
S3 16
Serial port 17, 20, 21, 50
Serial port commands 33
Sessions 15
Set-up Password 39
Sets value of Register 33
Signal Strength Information 30
Signal to Noise Ratio Information 30
SIT files 19
Software User License Agreement 61
Speed Conversion 66
Speed conversion 25
Standard AT command set responses 46
"Standard AT" Result Codes 47

T

Tech Support 61
Technical Specifications 66
Telephone line 51
Terminal Emulation Setup 18
Terminal mode 49
Terse/Verbose 46
Testing 51
Time Elapse for Escape Sequence 44
Time for Carrier (Abort Timer) 41
Tone Dialing: Tone Spacing and Duration 42

Transmission speed 17
Transmit buffer size 25
Transmit Level 69
Trellis Coded Modulation selection 34

U

UARTs 20, 21, 54
16450 20
16550 ..... 20, 21, 54
8250A 20
Buffers 20, 21

V

V.32terbo handshaking process 35
V.34 Line Probe 27
V.42 20
V.42bis 17, 19, 20

W

Wait for ringback 37
Wait Time for Dial Tone 41
Warranty 60
Weight 69
Windows 3.1 ..... 20, 21, 54
Serial port driver 21, 54
Windows 95 Autodetect (I9) 30
Windows 95 HyperTerminal 53

X

Xmodem 54
Xon/Xoff flow control 28

Y

Ymodem/G 54

Z

ZIP files 19
Zmodem 54